


# Chapter 4




## Trawl Sampling

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## **I. Introduction**

At least 70% of all WCGOP observer days are aboard trawlers. West Coast trawlers target a variety of species, including Dover sole, sablefish, thornyheads, Petrale sole, Arrowtooth flounder, and CA halibut. Trawl catch is often very heterogeneous, containing multiple species of fish and invertebrates in each haul. A trawl trip can last from one to seven days. All West Coast trawlers deliver to shore-based processors.

## **II. Trawl Gear and Fishing Strategy**

Most trawl vessels on the west coast are stern trawlers. They use one net that is set and retrieved off the sloping stern ramp at the back of the vessel. However, there are also side haulers. These vessels set and retrieve their nets over the side of their vessels (See Figure 4-1 and Figure 4-2).

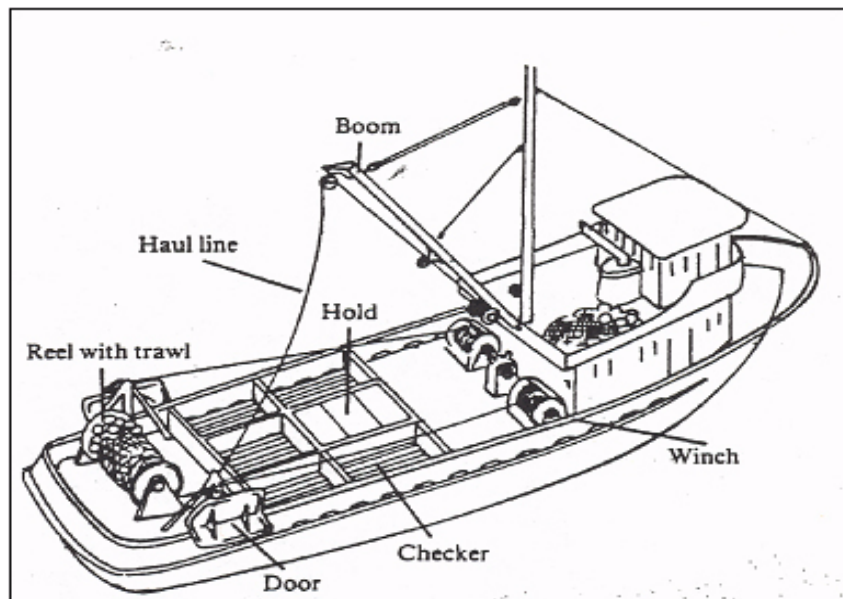


Figure 4-1: Trawl Vessel



Figure 4-2: Side hauling versus stern hauling

**Main wire** - the two large cables used to connect the trawl net to the fishing vessel while fishing.

Trawling involves the towing of a funnel-shaped net behind the fishing vessel (See Figure 4-3). Trawl nets may be towed on or near the seafloor or in the water column. West coast trawlers use “doors” in front of and on each side of the net to spread the mouth of the net horizontally. The doors are pushed apart and down by hydrodynamic forces and by their own weight. Aluminum or plastic floats laced to the headrope on the upper lip of the net and a weighted footrope, laced to the lower lip of the net, hold the net mouth open vertically. The length of the cable (**main wire**) dragging the net behind the vessel determines the towing depth. Trawl nets can be 100’ or greater in width across the opening and over 150’ long.

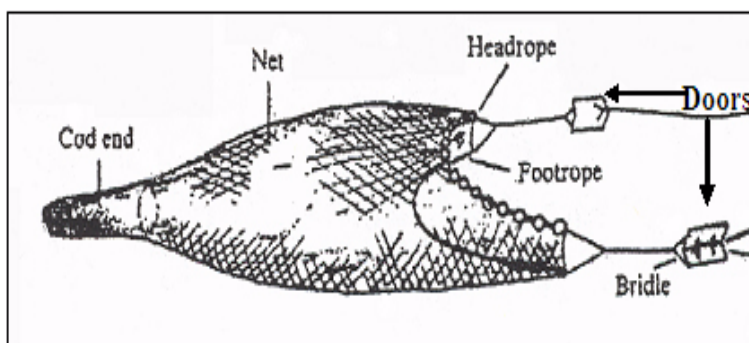


Figure 4-3: Trawl Net

The footrope or groundrope is directly attached to the bottom, leading edge of the mouth of the net. The purpose of the footrope is to separate the target species from the

seabed and raise the netting far enough above the seabed to prevent damage. The footrope may be weighted with chain or may be rope-wrapped wire or cable when fishing on a soft bottom. If the net is towed over rough bottoms (as for rockfish) steel bobbins, rubber disks or rubber rollers ('tires') are attached to the footrope. The bobbins are designed to roll and drag over the bottom (See Figure 4-4).

Regulations governing harvest levels in the groundfish trawl fleet have a footrope component. There are two "sizes" of footropes used in the groundfish trawl fleet.

**Large Footrope** – Any footrope that includes one or more rollers that is greater than or equal to 8 inches in diameter.

**Small Footrope** – Any footrope where all rollers are less than 8 inches in diameter.

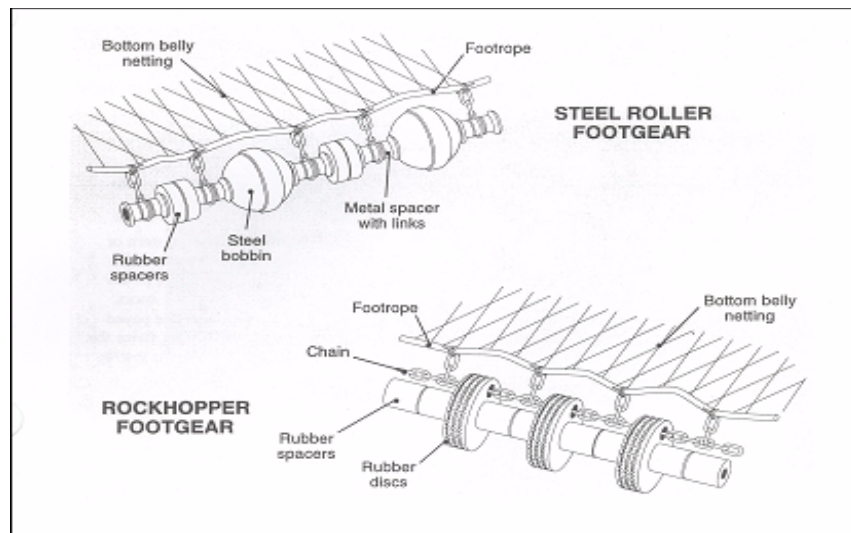


Figure 4-4: Roller Gear

There are a variety of types of trawl gear:

**Bottom Trawl** – One net is towed with the footrope in contact with the seabed. Bottom trawlers include roller (also called bobbin) trawls and Danish and Scottish seine gear. A bottom trawl is generally towed at two to four knots on or above the sea floor.

- **Selective Flatfish Trawl (Pineapple Trawl)-**  
This net is a type of bottom trawl (See Figure 4-5). It was designed by WOC fishers to reduce the catch of rockfish and other overfished species. Fishers used the net in an experimental fishery for two years to prove the efficiency. Based upon the findings, the PFMF now mandates its use in certain areas and/or increases quotas for vessels that use the selective flatfish trawl. The characteristics of this net includes:
  - A headrope that is cut back and at least 30% longer than the footrope, which allows fish a greater area to escape.
  - The expected rise, how high the headrope is above the bottom of the net, at the center is less than or equal to five feet.
  - No floats are on the center half or third of the headrope. Floats are only allowed on the wings.
  - A two seam, rather than four seam, net.
  - A small footrope can only be used with this net.

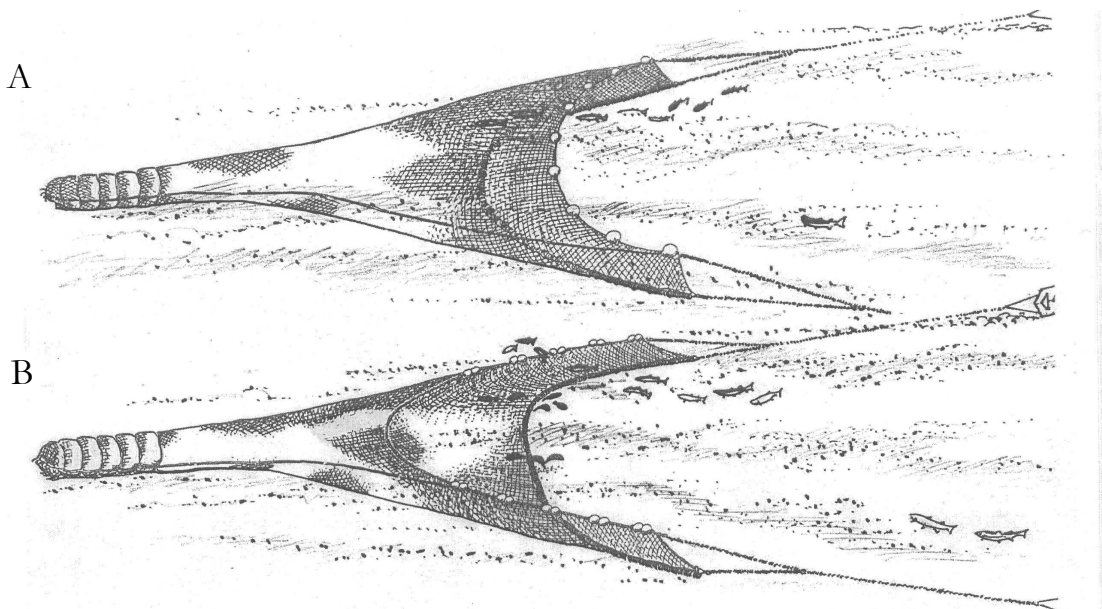


Figure 4-5: (A) Trawl net compared to (B) pineapple trawl net.

**Midwater Trawl** – Midwater trawls are generally towed above the ocean floor, although they may be used near the bottom. They are generally towed faster than bottom trawls to stay with the schooling fish they target. All midwater trawls must have a protected footrope without bobbins and rollers.

Trawl gear is used to harvest:

- Deep Water Slope Fish (Sablefish, Dover Sole, Shortspine and Longspine Thornyheads)
- Shelf and Slope Rockfish
- Midwater Rockfish (Widow, Yellowtail, and Chilipepper)
- Shelf and Slope Flatfish
- Pacific cod
- Pacific hake
- California Halibut

Trawl gear varies depending on the species sought and the size and horsepower of the boats used.

### **Operations of Trawlers**

The following flow chart represents typical activity of a trawl vessel.



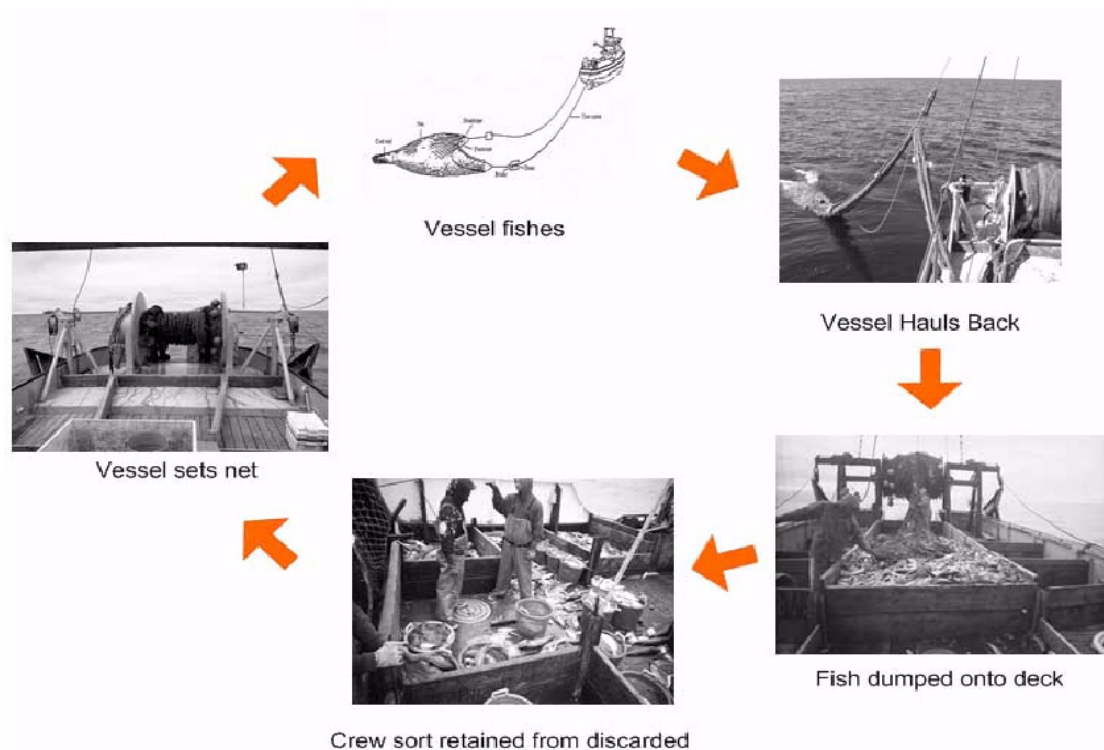


Figure 4-6: Typical activity of a trawl vessel.

### **Safety Concerns on Trawlers**

The equipment used by trawlers can cause serious injury if you are not aware while on deck.

Trawl nets are heavy and in rough seas, tend to roll around the trawl alley or bin. Be careful to avoid putting any part of your body between the codend and the trawl alley/bin boards as you can be crushed.

Be especially aware of the main wire and other cables being used to haul in a codend. If these snap, they fly in many directions and can cause major damage to the vessel and cause serious injury to the crew. Check for fraying on the wires during your first haul back. If the main wire is fraying , stay in the wheelhouse, with the hatch closed, while the crew is hauling in the codend. If you are on deck during haul back, always wear your safety helmet.



Be aware that working on trawl vessels often requires a lot of lifting. Take care to use proper lifting techniques on these vessels and wear a back brace if appropriate. Filling baskets partially instead of all the way to the top is a good way to reduce the amount of weight lifted at one time and can reduce the occurrence of back injuries. For more information on reducing the risk of back and wrist injuries, Chapter 9, “Health and Safety Information”.

### **III. Data Collection on Trawlers**

The following trawl fisheries are observed by the WCGOP:

Groundfish Trawl (limited entry)  
CA Halibut (open access)

Observers collect the following information on trawl vessels:

1. Fishing Effort
2. Total Catch
3. Catch Category Weight
4. Species Composition

This section of the manual is organized in the above order. This order is also the sequence you will normally use to collect data on trawl vessels.

### **Diversity of Fleet and Effects on Sampling**

Although vessel characteristics make the fleet very diverse, sampling protocols are consistent for all net vessels. There are, however, a number of vessel characteristics that influence catch sampling. The most important characteristics that influence sampling are:

Trawl vessels on the West Coast range from 40 feet to 80 feet.

1. **Vessel size** – The size and layout of a vessel is often a limiting factor when sampling. A vessel with a small deck may not have enough deck space to hold all the discard.

Trawl tows range from 45 minutes to 20 hours.

Trawl tows range in size from 100 lbs to 40,000 lbs.

Trawl tows can have as few as 5 species and as many as 45 species.

**Types of crew sorting on Groundfish Trawl vessels:**

1. Crew sorts retained into bins or baskets while leaving discard on deck.
2. Crew sorts out a scupper-retained fish are taken out of the flow of fish while discards are flushed directly off the vessel.
3. Crew sorts retained into bins or baskets and tosses or scoops discard overboard.
4. Crew presorts certain species.
5. Crew sorts from chute that discards fish directly over the side.

Therefore, the vessel may sort the discard directly out a scupper, over the side or down the stern ramp. On small vessels, observers may not have a designated sample area or a sample area with much space.

2. **Duration of tow** – Tow duration can vary greatly. If a vessel is making long tows, over 3 hours, observers will have plenty of time to sort and weigh samples. Observers on vessels that haul every hour have a limited amount of time to complete sampling duties.
3. **Size of tow** – Vessel size and size of tow are related. Problems are created when a small vessel has a large tow because there is very little room for the work up of samples. It can also create a dangerous working environment.
4. **Composition of tows** – Most tows encountered will have a large diversity of fish species. This is not necessarily a problem for experienced observers that are able to identify species easily. However, the species composition of the tow will affect the sample size. If the vessel has a bag full of tiny thornyheads or flatfish, it may be necessary to reduce the sample size.
5. **Sorting technique of crew**– Each vessel will have a unique sorting method. Talk with the crew prior to the first haul to discuss how they sort and the best way to collect the samples. Communicating with the crew that samples will be collected from **discard only** is key to fulfilling sampling requirements

All of the factors above are interrelated. For example, if a small vessel has short tow duration and tows are large, how the combination of these factors affect sampling options needs to be considered.

## IV. Fishing Effort Information

Fishing Effort information includes where vessels fish, how long it takes fishers to catch fish, what fishers are attempting to catch, what type of gear is being used, and how much is being caught. All of this information is recorded on the Trip Form. The front side of the form includes total catch and gear performance information while the back side is the haul location information. The specifics of estimating total catch are discussed in the next section.

### Trip Form Instructions

See Trip form Figure 4-7: Trip Form (front) on page 12 and Figure 4-9: Trip Form - Haul Locations (Back) on page 18.

**EFP** -Permits that allow fishing activities that would otherwise be prohibited. The permits are usually written by the states and must pass a vote by the PPMC.

**Question:** What's a trip?

**Answer:** A trip is a fishing activity that typically results in the completion of a fish ticket (landing receipt). The exception is when the vessel fished but did not retain any species.

- **Fishery Type** – Circle the fishery type the vessel participated in (**LE** = Limited Entry, **OA** = Open Access, or **EFP** = Exempted/Experimental Fishing Permit).
- **Page #** – All Trip Forms are numbered together by trip. (If there are 5 Trip forms on one trip, number them 1 – 5.)
- **Trip Number** – This is an automatically generated number by the database. Complete this field once the trip has been started in the database.



**Tip\*** Some observers find it easier to start a trip prior to leaving port. Doing this allows the observer to fill in the Trip Number while at-sea rather than when the observer returns to port.

- **Observer Name** – Record your first and last name.
- **Year** – Record the year as YYYY.

- **USCG #** – Record the USCG vessel number. All Limited Entry groundfish trawl vessels have a six or seven digit USCG number. Request this number from the vessel skipper or a coordinator. **If the vessel does not have a USCG number, leave entry field blank and fill in the State Registration Number field.**
- **State Registration Number** – Use this field **only** if the vessel does not have a USCG number. The state registration number will begin with a **CF** in California, **OR** in Oregon, and **WN** in Washington.
- **Vessel Name** – Record the full name of the vessel.

Figure 4-7: Trip Form (front)

- **Partial Trips** – Check the box if the trip included more days than were observed. (Fish ticket includes unobserved catch.)



**Tip\*** Partial trips usually occur when a vessel fishes multiple day trips in a row.

- **Total # of Fishing Days (Known)** – Document the total number of days the vessel fished before landing. This field is only completed when the trip is a partial trip.



**Tip\*** Do not guess or make an assumption to complete this field. If you do not know how many days the trip lasted, leave column blank.

- **Fishery** - Record the name of the fishery the vessel was selected for.

Limited Entry Trawl

Limited Entry Sablefish

Limited Entry Zero Tier

CA Halibut

CA Nearshore

CA Open Access Fixed Gear

OR Blue/Black Rockfish Nearshore

OR Blue/Black Rockfish

**Question:** Why do observers record the “Washington-Oregon-California Groundfish Logbook” page number?

**Answer:** The fishing locations of vessels carrying observers are compared to the fishing locations of vessels not carrying observers to ensure vessel activity has not changed with observers on board.

- **Vessel Logbook Number (from “WOC Groundfish Logbook” Only)** - The Vessel Logbook number is the page number(s) where the skipper is recording the trip information. The Vessel Logbook number is on the lower left corner of the Logbook page (See Figure 4-8). Do not record the number of the entire Logbook!

Do not document the page number of any other Vessel Logbooks in this field. If the vessel is using a logbook other than the WOC Groundfish Logbook, document

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the logbook name and number in the Comments section.

Vessel Name Example      Departure: Date 7 6 96      Time 0400      Port Westport, WA  
 Federal Document No. 12345      Return: Date 7 8 96      Time 0600      Port Westport, WA  
 Crew Size (including Captain) 3      Buyer(s) Generic Seafoods

DATE mo/day	TIME local 24-hour clock	LATITUDE		LONGITUDE		Ave. depth of catch (fathoms)	NET TYPE	Target Strategy	Estimated pounds retained each tow - enter 4-letter code from species code list provided														
		Degrees	minutes	Degrees	minutes				SABL	DOVR	LCPN	SSPN	WOWW	YTRK									
7/6	set	1300	47	58.7	125	47.3	500	B	DTS	300	4,000	500	100										
	up	1730	48	02.6	125	45.5																	
7/7	set	0800	47	20.3	125	28.3	575	B	DTS	100	5,000	800	150										
	up	1400	47	46.4	125	34.4																	
7/7	set	1800	46	52.6	124	53.2	90	M	wbow					16,000	500								
	up	2200	46	54.1	124	53.6																	
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REMARKS:

Signed: John Doe

TO BE COMPLETED BY AGENCY

VESSEL	FISH RECEIVING TICKET NO.
PORT	

39761

Figure 4-8: The “Washington-Oregon-California Groundfish Logbook.”

- **Skipper’s Name** – Record the first and last name of the skipper.
- **Observer Logbook #** - Record the number on the front page of the Observer Logbook used to document information about the trip.
- **Departure Date/Time** – Document the date and time the vessel left port.
- **Departure Port** – Document the port the vessel departs from.
- **Landing Date/Time** – Document the date and time the vessel returns to port.

**Question:** Why are observers required to record Fish Ticket Numbers?

**Answer:** When observer data is analyzed, the total landed weight from the Fish Ticket is used to estimate the amount of discard by species per landed weight of target(s).

- **Landing Port** – Document the port the vessel returns to.
- **Fish Tickets Number** – Obtain the numbers of all landing receipts (fish tickets) from the vessel skipper, the port biologist, or the state liaison. **This is a required field for all fisheries and trips!**
  - CA fish tickets begin with a letter followed by six digits
  - OR fish tickets are seven digits
  - WA fish tickets began with a letter followed by six digits
- **WOC** - The state agency code will be **C** - for California deliveries, **O** – for Oregon deliveries, or **W** – for Washington deliveries.
- **Date** – Document the date in MM/DD/YY of fish ticket issuance.
- **Haul/Set Number** – Number hauls consecutively, starting with 1 for each trip.
- **Observer Total Catch Estimate (OTC)** – Record the total catch estimate to two decimal places. Observer Total Catch estimate is recorded in pounds.
- **Volume of Codend or Trawl Alley/Bin** – Document the volume of the codend or bin/rawl alley, to two decimal places, when weight methods “2 – Bin/Trawl Alley Estimate” or “10 – Codend Estimate” are used to estimate total catch. Volume is recorded in m<sup>3</sup>.



**Tip\*** Do not record the volume or density if the weight method column is not a 2 – Bin/Trawl Alley Estimate or 10-Codend Estimate.

- **Density** –Record density, to two decimal places, when weight methods “2 – Bin/Trawl Alley Estimate” or “10



– Codend Estimate” are used to estimate total catch. Density is recorded in lbs/m<sup>3</sup>.

- **Weight Method** – Enter the number for the weight method used to obtain the observer total catch estimate. The weight methods that may be used for Trawl OTC’s are:

2 - Bin/Trawl Alley Estimate

4 - Visual Estimate

6 – Other

10 - Codend Estimate



**Tip\*** See Appendix H:WCGOP Codes on page 25 for a complete list of weight methods.

- **Total Hooks/Pots** – This column will be blank on all trawlers.
- **Gear Performance** – Record one of the following codes to document gear performance.
  - 1 - No problem
  - 2 - Pot was in the haul
  - 3 - Net hung up
  - 4 - Net ripped
  - 5 - Trawl net or codend lost, pot(s) lost, other gear lost
  - 7 – Other problem – Document other gear related problem in the comments section
- **Beaufort Scale** – This is not a required field at this time. Do not fill in unless otherwise directed by program staff.
- **Comments** – Document any information that is important about the haul. If the vessel documented more than one target strategy, list other strategies in this column.
- **OTC Keypunch Check** – Sum the OTC’s for an entire trip and record total weight of trip in the OTC keypunch

check box (If there is more than one Trip form, sum total catch estimates of ALL hauls to obtain keypunch check.).

- **Total Hooks/Pots Keypunch Check** – This field will be blank on all trawlers.

### **Vessel Logbooks**

Limited Entry Groundfish trawlers are required to record fishing activities in a current NOAA Fisheries “WOC Groundfish Logbook” (See Figure 4-8). Observers copy this record to complete the Trip Form – Haul Locations for groundfish trawlers.

CA halibut vessels are not required to document fishing activities in a vessel logbook. Vessels that fish in the CA Halibut fishery often also participate in the LE Groundfish trawl fishery. Therefore, they may continue to fill out the “WOC Groundfish Logbook” during their CA Halibut trips.

If a logbook is not available, Captain’s often keep a personal journal of fishing effort information that you can use with their permission. If they do not, ask them to record the information on a piece of paper. Some observers may have a handheld GPS to use for coordinates also.



**Tip\*** It is important for observers to complete the Trip Form-Haul Locations after each haul. Some vessels may not fill in their Logbook until the steam in and/or record more or fewer hauls than actually occurred. If the Vessel Logbook is reviewed and copied after each haul, the risk of erroneous data recording is reduced.

### **Trip Form – Haul Locations**

See Figure 4-9: Trip Form - Haul Locations (Back) on page 18.

TRIP FORM - HAUL LOCATIONS

Haul/ Set #		Date		Time	Latitude		Longitude		Depth of Catch (fathoms)	Gear Type	Target Strategy
		Month	Day		Degrees	Minutes	Degrees	Minutes			
	Start					*		*			
	End					*		*			
	Start					*		*			
	End					*		*			
	Start					*		*			
	End					*		*			
	Start					*		*			
	End					*		*			
	Start					*		*			
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	Start					*		*			
	End					*		*			
	Start					*		*			
	End					*		*			
	Start					*		*			
	End					*		*			
	Start					*		*			
	End					*		*			

Trip Notes:

Figure 4-9: Trip Form - Haul Locations (Back)

Starred (\*) fields indicate information that can be obtained from the “Washington-Oregon-California Groundfish Logbook”

- **Trip Notes** – Document any information pertinent to understanding the trip.
- **Start and End Date\*** – Document the date the haul was set and the date the haul was retrieved as MM/DD.
- **Start and End Time\*** – Document the Pacific Standard Time (PST) the haul was set and retrieved in 24-hour notation (military time). A haul starts when the net has reached fishing depth and ends when the brake is released and haul back begins.

**Loran:** If the vessel is using Loran C, document the Loran coordinates. Send these to a coordinator in an Excel spreadsheet and they will return the latitude and longitude positions.

- **Start and End Latitude\*** – Document the latitude (in degrees, minutes, 1/100<sup>th</sup> of a minute) that the haul was set and retrieved.



**Tip\*** When an observer boards a vessel that has a GPS, check to be sure that it is recording in degrees, minutes, 1/100<sup>th</sup> of a minute. If not, ask the captain to change the view to 1/100<sup>th</sup> of a minute instead of seconds. (See Figure 4-10)

- **Start and End Longitude\*** – Document the longitude (in degrees, minutes, 1/100<sup>th</sup> of a minute) that the haul was set and retrieved.



Figure 4-10: GPS Showing Latitude and Longitude

**Fathoms:** 1 Fathom = 6 Feet

- **Depth\*** – Document the fishing depth in **fathoms**. The “Washington-Oregon-California Groundfish Logbook” only requires the vessel to document the depth at which most of the fish were caught. If only one depth is documented, use it for both Depth fields.
- **Gear Type\*** – Enter a code for the gear type based on the configuration of the gear, rather than how it is being fished.

- 1 - Groundfish Trawl, Footrope < 8 inches  
(Small footrope, Not a pineapple trawl)
- 2 - Groundfish Trawl, Footrope > 8 inches  
(Large footrope)
- 3 - Midwater Trawl
- 4 - Danish/Scottish Seine
- 5 - Other Trawl Gear
- 14 – All Net Gear Except Trawl
- 17 – Pineapple Trawl (small footrope)

**\*\*If the fishing vessel is not using one of the above gear types, this is most likely the wrong section of the manual. Please refer to Chapter 5, “Fixed Gear Sampling” and/or Chapter 6, “Fixed Gear Sampling on Small Boats” \*\***

- **Target Strategy\*** - Enter the vessel’s target strategy. Refer to Appendix F: Catch Categories and Target Strategies on page 22 for a list of target strategies. If the vessel is recording more than one target strategy on a single haul, record the strategy that has the largest representation in the catch. Document other target strategies recorded in the haul comments.

## **V. Observer Total Catch Estimates (OTC)**

OTC's must be obtained for all hauls while you are on-board. There are four options for obtaining OTC on trawlers. They are discussed below in order of preference. Volumetric estimates for OTC (weight methods 2 and 10) are discussed in detail in the next section.

*Weight Method 2 – Bin Volume (volumetric)*

*Weight Method 10 – Codend Estimate (volumetric)*

*Weight Method 4 – Visual Estimate*

*Weight Method 6 – Other*

### **Weight Method 2 – Bin Volume**

Total catch is estimated by bin volume when all of the catch is dumped into one or more measurable areas. Simple volumes are calculated using the measurements (length, width, and/or height) of those areas. Then, densities are calculated and multiplied by the measurements.

### **Weight Method 10 – Codend Estimates**

Codend measurements (length, width, and/or height) are multiplied by a density to obtain a total catch estimate. Vessel and weather conditions often make codend estimates dangerous so they are discouraged if a bin volume can be made.

### **Weight Method 4 – Visual Estimates**

Often, visual estimates are the best option for the estimation of total catch. There are a number of circumstances that necessitate the use of visual estimates including hauls dumped at-sea, bad weather conditions, seasickness, and of course, when all other options for estimating OTC are impossible.

Because visual estimates for OTC are so often the only option, the WCGOP wants to increase the accuracy of these

estimates. Therefore, **observers are required to visually estimate OTC for every haul on net vessels.** Record the visual estimate on the back of the Catch form.

### **Weight Method 6 – Other**

This weight method should never be intentionally used. It creates confusion for end users and debriefers because it does not indicate how the weight was actually derived. If this method is used, document what happened in the observer logbook and on the paperwork.

This weight method is typically documented when two weight methods were used to determine the total catch estimate. This occurs when a vessel dumps part of a codend on deck and the observer gets a volumetric estimate while some of the catch is discarded at-sea and is visually estimated.

### **◆◆◆SPECIAL NOTE◆◆◆**

Other weight methods can be used to estimate total catch on trawlers, but they are not preferred. On trawlers, observers provide two estimates of total catch weight. The first estimate is the OTC recorded on the Trip Form. This should be an independent estimate, not influenced by any factors. The second estimate of total catch weight is provided from the Catch Form. Observers must document the weight of all catch (retained and discarded) by catch category on trawlers on the Catch Form. Therefore, the sum of the weights of the catch categories is a second estimate of total catch weight.

If observers record the same weight on both forms, only one estimate of total catch is captured. Therefore, the estimate of total catch weight on the Trip Form should, in all circumstances, be by one of the four weight methods listed above.



## **VI. Volumetric Estimates**

There are two weight methods that employ volumetric estimates:

- 2 – Bin Volume/Trawl Alley Estimates
- 10 - Codend Estimates

Volumetric estimates for OTC should be made on all trawlers unless:

- The codend is irregular in shape, such as a blob, and it is not dumped into a bin/alley.
- Vessel or weather conditions make volumetric estimates unsafe.
- Codend is irregular in shape and is dumped into a bin/alley but the height of fish in the bin/alley is too low to take a good measurement.

Bin/Trawl Alley estimates are much easier, produce better results, and are safer than Codend estimates. **Always use a Bin/Trawl Alley estimate over a Codend estimate.**

There are two steps in obtaining volumetric estimates.

1. Obtain the volume of the codend or bin/trawl alley where the fish reside.
2. Obtain a density for the fish.

### **Weight Method 2 - Trawl Alley or Checker Bin Estimates**

1. **Determine the appropriate volume formulas for each area of the bins and/or trawl alley.** Most bins and trawl alleys will be rectangular, however, some will have odd shaped areas (See Figure 4-11 and Figure 4-12).
2. **Measure the area of the empty bins and trawl alley in meters.** It is easiest to measure the area of the bins

and trawl alley prior to leaving the dock. If the bins and trawl alley have easily definable sections, measure them independently. Often, a catch only fills up a portion of the total area. **Draw the trawl alley and bins in the Observer Logbook and document the measurements of each area.** From these measurements, the total area of the bin will be available.



$$\text{Total Area (m}^2\text{)} = \Sigma \text{ of Areas (m}^2\text{) of All Bins}$$

3. **Measure the height of the catch in the bin in meters.** The height of the fish in the bin provides the final dimension needed to obtain the volume of the catch. Height is measured by placing a calibrated stick into the bin to measure the depth of fish at one or several points. If the height of fish varies throughout the bin, multiple height measurements should be taken. If multiple heights are measured:



$$\text{Average Height of Fish in Bin (m)} = \frac{\text{Height A (m)} + \text{Height B (m)} + \text{Height C (m)} + \dots}{\text{\# of Height Measurements Taken}}$$

4. **Calculate and record catch volume.** Record measurements and calculations on the back of the Catch form. Make sure that all of the measurements are as precise as possible. To obtain volume of the catch:



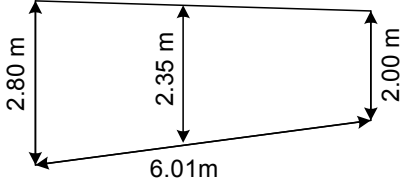
$$\text{Volume of Catch (m}^3\text{)} = \text{Total Area of Bin (m}^2\text{)} \times \text{Average Height of Fish in Bin (m)}$$

5. **Calculate total catch estimate.** Multiply the volume by the density to calculate OTC:



$$\text{OTC (lbs)} = \text{Volume of bin/alley (m}^3\text{)} \times \text{Density (lbs/m}^3\text{)}$$

$H = .23\text{m}, .19\text{m}, .17\text{m}$



$A = L \times W$

$W_{\text{avg}} = \frac{2.80\text{m} + 2.35\text{m} + 2.00\text{m}}{3} = \frac{7.15\text{m}}{3} = 2.383333333\text{m}$

$A = 6.01\text{m} \times 2.383333333\text{m} = 14.32383333\text{m}^2$

$H_{\text{avg}} = \frac{.23\text{m} + .19\text{m} + .17\text{m}}{3} = \frac{.59\text{m}}{3} = .196666666\text{m}$

$V = L \times W \times H$

$V = 14.32383333\text{m}^2 \times .196666666\text{m} = 2.817020545\text{m}^3$

Figure 4-11: Bin Volume Calculation



Figure 4-12: Trawl Alleys and Bins

### **Weight Method 10 - Codend Estimates**

When measuring a codend, always remember that **safety is the first concern** (See Figure 4-13). Nets tend to slide and roll. Be careful not to get caught between the net and the trawl alley bin boards. Ask crew members for assistance; their help will make the task easier and safer. Follow the steps below to take an accurate codend measurement.

1. **Determine the appropriate geometric shape(s) and decide on the appropriate formula(s) to use.** Using the formula, determine which dimensions will be measured in order to obtain a volume. Refer to Appendix J:Weights, Measures, and Conversions on page 27 for the formulas required to calculate the various volumetric shapes.
2. **Measure the various dimensions of the codend using actual measurements and/or reference points.** Take height and width measurements from several segments to obtain an average height and width for the net. It may be necessary to acquire a long stick, or a similar item, and mark it for use as a height gauge. When sighting across the net for a height, the observers eyes should be level with the top of the net.
3. **On the back of the Catch form, record the method, formula, dimensions, and calculations used in obtaining the volumetric estimate.** To calculate the total volume of the codend: (\*Most measurable codends require the use of the ellipsoidal formula below. This is used as an example formula and is not the formula used for every codend shape)



$$\text{Volume (m}^3\text{)} = (.7854) \text{ Length (m) x Width (m) x Height (m)*}$$

4. **Calculate total catch estimate.** Multiply the volume by the density to calculate OTC.:



$$\text{OTC(lbs)} = \text{Volume of codend (m}^3\text{)} \times \text{Density (lbs/m}^3\text{)}$$



Figure 4-13: Codends

### ***Measuring Large Codends***

Occasionally, a full codend is larger than the trawl deck and must be brought on board and emptied in several sections. To determine the codend volume in this situation, measure the codend sections as they are brought on-board. Use the

reinforcing cables, or “expansion straps”, around the circumference to divide the codend into sections. Determine a volume for each segment of the net measured and add them together for a total volume of the codend. **Do not apply a predetermined or constant volume to the number of codend segments to calculate the OTC!**

### **Obtaining Densities for Total Catch Calculations**

Once the volume of bin/alley or codend has been obtained, it is necessary to determine the density of fish in that area. Density is weight per unit of volume. For our purposes, it is expressed in pounds per meter<sup>3</sup> (lbs/m<sup>3</sup>). Densities will need to be estimated from each haul a bin/alley or codend estimate is used for OTC.



$$\text{DENSITY} = \frac{\text{WEIGHT (LBS)}}{\text{VOLUME (M}^3\text{)}}$$

### ***Density Requirements***

It is necessary to measure both the volume and weight of a sample of the catch to estimate density. The observer baskets are an excellent density container. Use **TWO** or more observer baskets for the density sample for each volumetric estimate. Densities should be taken for every volumetric estimate. When taking density samples:

- Take a random sample of **unsorted** catch. Document random sampling methods in the Observer Logbook.
- Try to minimize the interstitial spaces and fill the baskets to the same level.

- If using observer baskets, fill them all the way to the top (.044 m<sup>3</sup>) or to the top of the last line of holes (.032 m<sup>3</sup>) (See Figure 4-14).



**Tip\*** The WCGOP encourages observers to use the less full basket volume (.032m<sup>3</sup>) when taking density baskets. The lower weight may help prevent back and wrist injuries.

- Weigh each density basket and record this weight on the back of the Trawl/Prawn Pot Catch Form.

Document calculations used to determine density on the back of the Catch form. Be sure to include the formulas used.

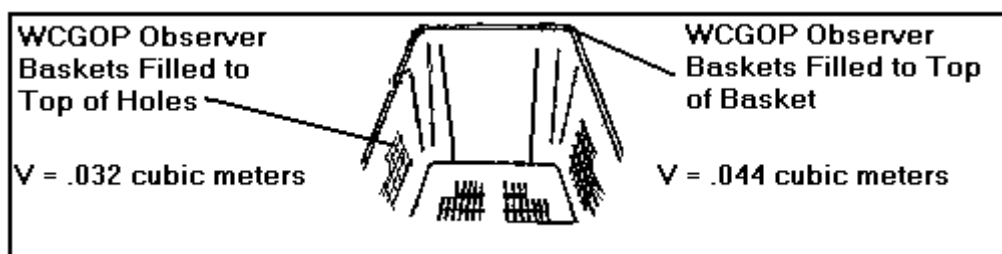


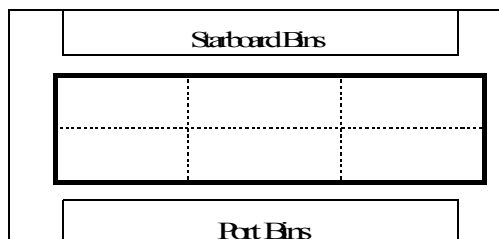
Figure 4-14: Observer Basket Volumes

### ***Procedure for Calculating Density***

After the codend is dumped or after the height measurements for bin/alley estimates have been completed, randomly select area(s) to take density baskets. Below is an example of on how to implement random sampling for density baskets.

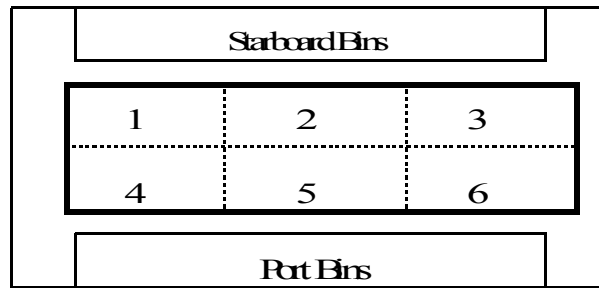
1. Split the trawl alley into sections of equal size.

For example:





2. Number the sections



3. Use a clock or numbered pieces of paper to determine which section(s) to take the sample from. It's better to take baskets from two randomly selected sections than just one due to the possibility of stratification.



**Tip\*** Use a clock by assigning each section a ten second time period (i.e. section one equals 0-9 seconds) and then glance at the watch twice to determine which sections to take baskets from. Or tear up six pieces of paper, number them 1-6, and pick two prior to the haul back.

4. Fill baskets to either the top of the holes in the basket or the top of the basket using individuals from selected section(s). Collect fish by moving down and out through the fish, being sure to reach the deck.
5. Weigh baskets.
6. Determine the average basket weight.



$$\text{Average Basket Wt (lbs)} = \frac{\text{Wt of Basket A (lbs)} + \text{Wt of Basket B (lbs)} + \dots}{\text{\# of Baskets Weighed}}$$

7. Determine the density of the catch.



$$\text{Density (lbs/m}^3\text{)} = \frac{\text{Average Weight of Baskets (lbs)}}{\text{Volume of Baskets (m}^3\text{)*}}$$

\*The volume of the basket is a known. The volume of a basket filled to the top of the holes equals  $.032\text{m}^3$  and the volume of a basket filled to the top equals  $.044\text{m}^3$ .

### OTC Calculation

Use the bin/alley or codend volume and the density to calculate OTC.



$$\text{OTC (lbs)} = \text{Vol. of Codend or Bin / Alley (m}^3\text{)} \times \text{Density (lbs/m}^3\text{)}$$

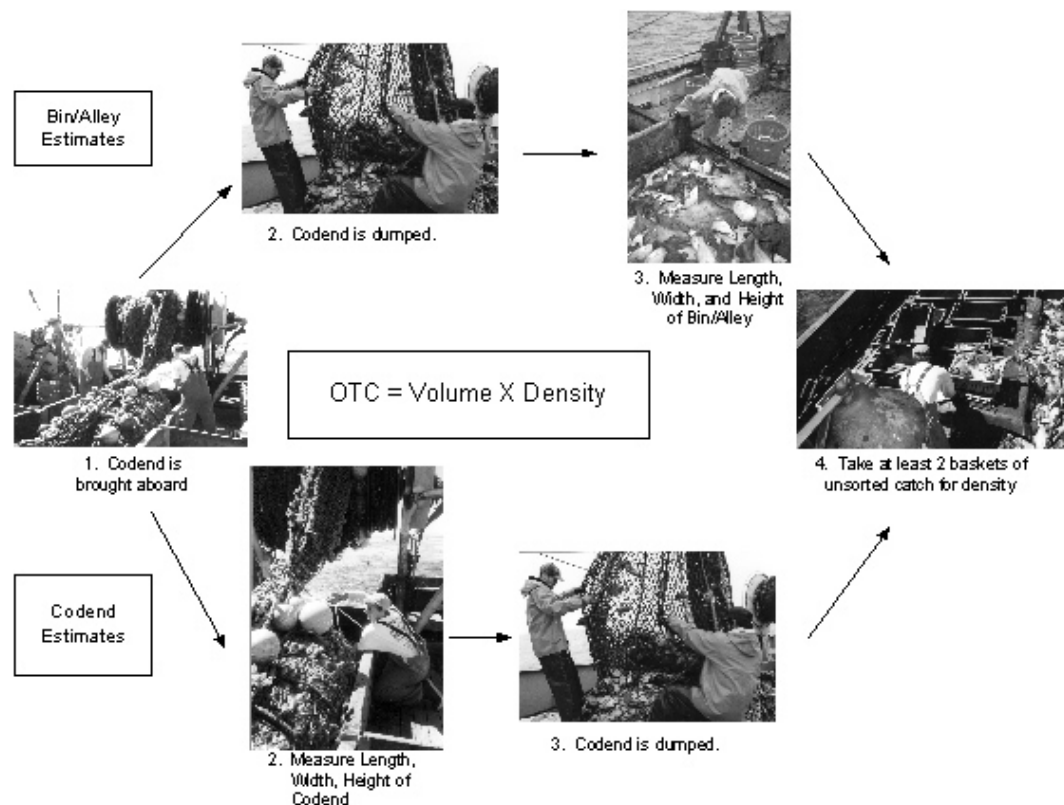


Figure 4-15: Schematic of estimating OTC on a trawl vessel

### Review of Steps for Obtaining a Volumetric OTC

1. Codend is brought aboard. If using bin/trawl alley volumes, codend is dumped in trawl alley or bins. (See Figure 4-15)

2. Decide which formula best describes codend or bin.
3. Take all length, height and width measurements required for the formula.
4. Take a minimum of two baskets of randomly selected, unsorted catch for densities.
5. Multiply density by the volume of codend or bin/alley to calculate OTC.

## **VII. Sampling Catch**

After the density baskets are taken, THE CREW will sort the catch into retained and discarded. They will place the retained catch in baskets, bins, or other holding containers and either remove the discard from the vessel or relocate it out of their way. Each state has port samplers who obtain information from the retained catch at delivery. **Therefore, the observer's primary responsibility is to sample the discarded portion of the catch.**

### **Catch Categories**

Chapter 3, "Observer Basics" discussed catch categories briefly. This section provides a review and more specific information regarding catch categories on trawl vessels. As a review, there are two rules that apply to catch categories:

- Retained and discarded individuals are always in separate catch categories.
- All individuals with the same weight method and sample method are recorded in the same catch category.

### ***Retained Catch on Trawlers***

Normally, observers do not independently estimate the weight of retained catch categories on trawlers. On LE trawlers, fishers are required to record the weight of retained species by catch category in the WOC Vessel

Logbook. Observers copy these estimates for retained catch **exactly**, unless:

- Vessel does not record catch category (often happens with species retained in small quantities)
- Vessel uses an invalid PacFin code (Select most applicable name from Catch Category list, see Appendix F: Catch Categories and Target Strategies on page 22).
- Vessel estimates of retained catch not representative of the weight and/or composition of the catch.

Fishers in the CA halibut fishery are not required to document their retained catch. However, observers are still responsible for obtaining an estimate. This can be done by simply asking the skipper for an estimate or by obtaining an independent estimate using one of the weight methods discussed later in this chapter.

### ***Discarded Catch on Trawlers***

The amount of fish discarded on trawlers is extremely variable, from close to 0% to 100% of the total catch. Observers sort the discard into one or multiple catch categories. There are three factors that distinguish discarded catch categories from each other on trawl vessels:

#### **Vessel Sort Example:**

Often vessels will presort some species. This means they remove them from the deck immediately. Presorted species would fall into a separate catch category than those not presorted.

**Vessel/Observer Sorting** – If the entire discard is not weighed and the crew sorts species different ways, then the species will fall into catch categories based on the way the crew sorted them. Observer sorting of discard may also lead to species falling into different catch categories.

**Weight Method** – The method used to obtain the weight estimate of the catch category is the primary factor that determines the number of discarded catch categories. If portions of the catch have different weight methods this requires them to be in different catch categories.

**Sample Method** – If species have the same weight method but are sampled for species composition differently, this also requires them to be in different catch categories.

### **Sampling Priority on Trawlers**

The amount of fish caught on trawlers prohibits observer sampling of the entire catch. The priority for observer sampling on trawlers is:

1. **Discarded** Prohibited Species - Pacific Halibut, salmon species, and Dungeness crab (North of Point Arena)
2. **Discarded** Overfished Species - Cowcod, Dark-blotched rockfish, Pacific Ocean Perch, Canary rockfish, Yelloweye rockfish, Bocaccio rockfish, Widow rockfish
3. **Discarded** Rockfish Species
4. Species that are both retained and **discarded**. Because some species are high-graded or have size restrictions, a sample of the discarded individuals is very important.
5. All Other **Discarded** Species



**Priorities 1 - 5 must be completed on ALL hauls**



6. **Retained** Species not recorded by vessel.
7. **Retained** overfished species
8. **Retained** rockfish species
9. **Retained** mixed species catch categories. Vessels will mix flatfish or rockfish species. If the crew is mixing species, take a species composition sample from the mixed group.
10. Other **Retained** Species

Observer effort on trawlers is focused on obtaining the most accurate estimates of discarded catch possible. Remember that through the use of catch categories, more precise methods of estimation can be used for those higher priority groups (prohibited species, overfished species, rockfish). But, **all** discarded catch weight must be estimated using one of the weight methods listed below.

### **VIII. Weight Methods for Estimating Catch Category Weights**

There are 10 weight methods that can be used to determine catch category weights on trawlers:

- 1 - Actual weights
- 2 – Bin Volume/Trawl Alley Estimate
- 3 - Basket Weight Determination (BWD)
- 4 - Visual Estimate
- 5 - OTC – Retained
- 6 - Other
- 7 – Vessel Estimates (Retained only)
- 8 – Extrapolation
- 9 – Pacific Halibut length/weight
- 10 – Codend Estimates

The weights obtained by these methods are recorded on the Trawl/Prawn Pot Catch form.

#### **Weight Method 1 – Actual Weights**

1. Place all of the individuals from the catch category in observer baskets.
2. Weigh baskets. There will be one catch category for all of the species in the baskets.



$$\text{Catch Category Wt(lbs)} = \sum \text{Basket Weights}$$

OR

1. Sort all of the individuals in the catch category by species.
2. Weigh each species group.



**Catch Category Wt(lbs) =  $\Sigma$  All Species Groups in Catch Category**

### **Weight Method 2 – Bin Volume\Trawl Alley Estimates**

1. Take measurements of the trawl alley and/or bins.
2. Multiply measurements using appropriate volumetric formula.
3. For each bin measured, take a minimum of two density baskets.
4. Find the average weight of the density baskets, and then divide by the basket volume to get density (lbs/m<sup>3</sup>).



**Catch Category Wt(lbs) = Total Vol(m<sup>3</sup>) x Density(lbs/m<sup>3</sup>)**

For more detailed instructions on bin volumes, see “Volumetric Estimates ” on page 23.

### **Weight Method 3 – Basket Weight Determinations (BWD)**

1. Visually estimate the number of baskets it will take to hold the entire catch category.
2. Devise a sampling plan to randomly select baskets to use for average basket weight determination. Use a spatial, systematic, or temporal frame. *See “Method to Randomly Select Baskets for Weights” on page 37.*



3. Place **all** catch into baskets to obtain the total basket count. Each basket should be filled to the **same level** and contain a random sample of discard.
4. Weigh each randomly selected basket. **A minimum of four baskets must be weighed when using the BWD weight method** but observers are encouraged to weigh at least 6 – 10 baskets.
5. Calculate average basket weight by summing all the basket weights and dividing by the number of baskets sampled



$$\text{Average Basket Weight (lbs)} = \frac{\sum \text{Basket Weights}}{\# \text{ of Baskets Sampled}}$$

6. If a partial basket remains, record the weight and add it to the calculated BWD estimate.
7. All of the species in the baskets will be included in one catch category.



$$\text{Catch Category Wt} = (\# \text{ Full Baskets} \times \text{Average Basket Wt}) + \text{Wt. Partial Basket}$$

### *Method to Randomly Select Baskets for Weights*

#### **Systematic (preferred)**

Other methods for selecting baskets are possible, but this is the preferred method.

- a. Define population – **All baskets of fish in the catch category.**
- b. Define sample frame – **Spatial systematic, based on baskets of fish.**
- c. Define sample units – **Single baskets of fish.**
- d. Number all sample units; this may require estimating how many baskets the catch category

will fill; for example, estimate that catch category will fill 15 baskets - **Number baskets 1 – 15.**

- e. Decide how many of the sample units you will weigh – **Decide to weigh 5 baskets.**
- f. Divide the total number of sample units by the number of units you want to weigh. This gives you your value for “n”.  **$n = 15/5 = 3$ .**
- g. Randomly select a number between 1 and n. This will be the first sample unit in your sample. Use random number table to select a number between 1 and 3. – **Randomly select 1.**
- h. Weigh the selected basket and then every  $n^{\text{th}}$  basket after that - **Weigh baskets 1, 4(1+3), 7(4+3), 10(7+3), and 13(10+3).**
- i. Accurately document actual amount of time during which samples are collected.
- j. Use weight of sample to calculate weight of entire catch category.

#### **Weight Method 4 – Visual Estimates**

Visual estimates can be used for large amounts of mud, rocks, and miscellaneous junk.

Visual estimates are the least preferred option for obtaining a catch category weight but are sometimes the only option available. Visual estimates fall into two categories. There are visual estimates where a “known” is used to determine the total catch category weight and visual estimates where the observer makes the best possible determination based solely on experience.

**Visual Estimates based on a “known”** - There are three acceptable methods for obtaining visual estimates based on a “known” value: basket estimates, spatial estimates, and temporal estimates.

**Basket Estimate** - Estimate the number of baskets it would take to hold the entire catch category to obtain an estimate of catch category weight.

1. Take a representative random **subsample** of the catch category using a spatial, systematic or temporal frame. (See discussion on random selection of baskets for Weight Method 3 for more detail)
2. Weigh each subsampled basket.
3. Derive the average basket weight for the catch category.
4. Visually estimate the number of baskets it would take to hold the entire catch category and multiply by the average basket weight.



$$\text{Catch Category Wt} = \text{Average Basket Wt(lbs)} \times \text{Visual Estimate of Total \# of Baskets}$$

**Spatial Estimate** - Estimate the weight of a catch category by taking a subsample of the discard from a randomly selected spatial unit.

1. Define population – **All fish in selected area of trawl alley.**
2. Define sample frame – **Spatial, based on visual division of area into equal units. For example, visually divide the trawl alley into quarters.**
3. Define sample units – Single unit of space. In example, **one quarter of trawl alley.**
4. Number all sample units consecutively. **Number areas 1-4.**
5. Decide how many of the sample units you will sample – **Decide to sample 1 sample units.**

6. Pick random numbers to choose which units to sample. – **Randomly select 1 number between 1 – 4 and collect all discard from that area..**



$$\text{Catch Category Wt.} = \frac{\text{Weight of subsample (lbs)}}{\% \text{ of Total Area Subsample Represents}}$$

**Temporal Estimate** - Estimate the time it would take to sort the entire catch in relation to a subsample to obtain an estimate of catch category weight.



**Tip\*** Temporal Estimates can be used when vessel is sorting discard out a scupper.

When **Temporal Visual Estimates** are used to estimate catch category weight, observers must document:

- Start time of sort
- Start time(s) of sample units
- End time(s) of sample units
- End time of sort
- Breaks in sort

1. Define population – **Everything that will be sorted out of the catch.**
2. Define sample frame – **Temporal; may be either systematic or non-systematic.**
3. Estimate the amount of time it will take to sort through catch.
4. Define sample units; there are two options:
5. Set blocks of time – **For example, break a one-hour sort time into 6 10-minute sections.**
6. Set number of baskets to be collected starting at selected points during the sort – **For example, decide to collect 2 baskets at each randomly selected time during the sort.**
7. Randomly select units of time to sample or times to start collecting baskets.

8. Document actual start time of sort, start and end time(s) of sample unit(s), any breaks in the sort, and actual end time of sort..



$$\text{Catch Category Wt.} = \frac{\{ \text{Weight of Subsample (lbs)} \} \times \text{Total Time for Vessel to Sort Catch}}{\text{Time to Take Subsample(min)}}$$

### Visual Estimates Based Solely On Experience

This method will be employed when observers are unable to use a “known” value to determine total catch category weight. An example of when to employ this method is for codends that are fully or partially dumped at-sea. Observers will be unable to take any measurements or “known” values for the codend. Base the visual estimate on codends seen in the past.



**Tip\*** If a catch category does not have a species composition sample, use the most descriptive PacFin code possible.

### Weight Method 5 – OTC – Retained

This weight method is to be used ONLY if the discarded catch is not sampled due to illness or injury.

1. Estimate OTC - It is preferred *Weight Method 2 – Bin/ Trawl Alley Volume* or *Weight Method 10 – Codend Estimate* be used.
2. Estimate weight of retained fish using one or more of the weight methods.



$$\text{Catch Category Wt(lbs)} = \text{OTC - Retained Species Weights (lbs)}$$

### **Weight Method 6 – Other**

The most common reason this method is documented is when a combination of two weight methods is used. This weight method should never be intentionally used. It creates confusion for end users and debriefers because it does not indicate how the weight was actually derived. If this method is used, document what happened in the Observer Logbook and on the deck sheets.

### **Weight Method 7 – Vessel Estimates**

This weight method is used for **retained fish** only. LE Groundfish trawlers are required to record retained weights in their “Washington-Oregon-California Groundfish Logbooks”. **Since discard is the priority, observers usually use this weight method for all or most of the retained fish on groundfish trawlers.** If a vessel is not making estimates of retained catch, one of the other weight methods must be used to make these estimates.

- Copy retained catch category estimates from “Washington-Oregon-California Groundfish Logbook”.

OR

- Ask skipper for retained catch category estimate.

### **Weight Method 8 – Extrapolation**

This weight method is commonly used for fish that are **presorted** in the trawl fishery. The most common presorted species are sablefish and lingcod.

**Presort** – Vessels will attempt to get harder, live fish back into the water quickly. After a codend has been dumped, the crew will sort through the catch, pulling out individuals of these species and toss them over. This usually happens prior to any other sorting of catch.



**Tip\*** Pacific halibut are also presorted. See weight method 9 for sampling of Pacific halibut.

1. Count the number of individuals, by species.



**Tip\*** When weight method 8 is used, **an actual count of individuals is REQUIRED!!** The actual count must be recorded on the Catch Form in the Fish # column.

2. Devise a sampling plan to randomly select individuals from the presorted fish for average weights. Use a systematic, spatial, or temporal frame. **Specifics on implementing each type of sampling frame are described below.**



$$\text{Average Weight} = \frac{\sum \text{Individuals Weighed (lbs)}}{\# \text{ of Individuals Weighed}}$$

3. Document the species in a **single species category**. Apply the average weight to the total number of individuals of that species caught to obtain the catch category weight.



$$\text{Catch category Wt} = \text{Average weight} \times \text{Total Number of Individuals Caught}$$

### *Methods for Randomly Selecting Individuals*

- Systematic Random Selection
- Spatial Random Selection
- Temporal Random Selection

### **Systematic Selection (preferred method)**

Select individuals based on when they leave deck.

1. Estimate number of fish of particular species caught.

**Systematic Random  
Sampling Frame Example:**

The observer estimates that 60 Sablefish are usually presorted. In order to get 15 individuals, he divides  $60/15 = 4$ . That means that one of every four fish should be taken for average weights. Using the random number table, a number between 1 and 4 is randomly selected. A 3 is selected. The observer collects the 3rd, the 7th ( $3+4$ ), the 11th ( $7+4$ ), etc. individuals for average weights.

2. Break the number of fish into sampling units (n) by dividing the number of fish needed for average weights by the number of fish likely to be on deck.
3. Choose which fish to take first by selecting a random number that is between 1 and the sample unit (n).
4. Collect the  $n^{\text{th}}$  fish. Then collect every  $n^{\text{th}}$  individual after that.
5. Weigh all selected individuals and divide by the number of individuals weighed to determine average weight

**Spatial Selection**

Select all individuals from a designated area on the deck.

1. Visually divide the deck into equal units.
2. Randomly select a unit to take individuals from.
3. Take all individuals in that unit.
4. Weigh all selected individuals and divide by the number of individuals weighed to determine average weight..

**Temporal Selection**

1. Select all individuals sorted or on deck during a unit of time. Estimate the time it will take to sort out species.
2. Randomly select a designated time during sort to take individuals or randomly select a time to begin taking individuals.
3. Take all individuals during randomly selected interval or take individuals until enough have been collected.
4. Weigh all selected individuals and divide by the number of individuals weighed to determine average weight

**Weight Method 9 – Pacific halibut Length/Weight**

This weight method is used ONLY for Pacific halibut.



1. Visually estimate or Actually Measure the length for each Pacific halibut caught.
2. Use the Pacific halibut length/weight conversion table to obtain a weight for each individual (see Appendix K: Pacific halibut Length/Weight Table on page 29).
3. Sum the weight of all the Pacific halibut.



$$\text{Catch Category Wt (lbs)} = \sum \text{Pacific Halibut Wts from Length Weight Conversion Table}$$

### **Weight Method 10 – Codend Estimates**

If a codend estimate was done for OTC and all of the catch was discarded, this method is used. This rarely occurs! For directions on taking codend estimates, refer to “Volumetric Estimates” on page 23..



$$\text{Catch Category Weight} = \text{Volume (m}^3\text{)} \times \text{Density (lbs/m}^3\text{)}$$

### **Trawl/Prawn Pot Catch Form**

The Catch Form is the standardized form used to document Catch Categories, Catch Weight and Catch Weight methods. A Catch Form should be completed for all hauls (See Figure 4-16).

- **Haul Number** – Record the number of the haul.
- **Date** – Record the date as MM/DD/YY.
- **Trip Number** – Record the trip number generated by the database system.
- **USCG #** – Record the USCG vessel number (if they have one). If the vessel does not have a USCG number, leave this field blank.

- **Catch #** - Number the catch categories consecutively, starting at 1 for each haul. The numbers on the paper Catch Form must match the numbers assigned by the database when data is entered.
- **R or D** – Record whether the catch category is from retained or discarded catch. Record with an **R** – Retained or **D** – Discarded.
- **Catch Category** – Record, in capital letters, the catch category sampled in the 3 or 4-letter PacFin code. For a list of PacFin catch category codes, see Appendix F: Catch Categories and Target Strategies on page 22.
- **Weight** – Record the total weight of the catch category to two decimal places. Weight unit is pounds (lbs).
- **Volume** – If the catch category is estimated volumetrically (bin, trawl alley, or codend), record the measured volume in  $m^3$ . Record entry to two decimal places.
- **Density** – If the catch category is estimated volumetrically (bin, trawl alley, or codend), record the density in  $lbs/m^3$ . Record entry to two decimal places.
- **Number of Fish** – Record the total number of fish in the catch category if weight methods 4 – Visual Estimate, 8 – Extrapolation, or 9 – Length/Weight Conversion were used. Do not record the total number of fish for weight methods other than 4, 8, and 9.
- **Weight Method** – Document the weight method used to estimate the catch category weight.
  - 1 - Actual Weight
  - 2 - Bin Volume/Trawl Alley Estimate
  - 3 - Basket Weight Determination
  - 4 - Visual Estimate
  - 5 - OTC-Retained
  - 6 - Other

**Record numbers of fish for Weight Method 4 – Visual Estimate** only when an actual count of individuals has been obtained.

Do not record extrapolated numbers on the Catch form.

- 7 - Vessel Estimate
- 8 - Extrapolation
- 9 - Length/Weight Conversion  
(Pacific halibut only)
- 10 - Codend Estimate

- **Catch Purity** – If catch category was *sampled* for species composition, record a M - Mixed if more than one species was within sample. Record P - Pure if there was only one species in species composition sample.

If the catch category was *not sampled*, record as P – Pure if the catch category is composed of 95% or greater a single species or as M – Mixed if the catch category is composed of less than 95% a single species.

- **Discard Reason** – Record the skipper/crew's reason for discard for unsampled (no species composition sample taken) discarded catch categories only.

- 11 - Incidental/Accidental
- 12 - Drop-off
- 13 - Market
- 14 - Other
- 15 - Predation
- 16 - Regulation
- 17 - Safety

- **Vessel Estimate** – Fill in the vessel estimate (from the Vessel Logbook) in this column **ONLY** if an independent estimate of a retained catch category weight was taken. If the weight method for the catch category is 7 – Vessel Estimate, leave this column blank and fill in the vessel estimate in the catch weight column.
- **Comments** – Document anything important about each category. Important information could include the composition of a mixed (less than 95% pure) unsampled catch category. For example, if the skipper documents a retained catch category as REX and the rex sole is mixed

with sand sole, make a note of this in the comments column.

- **Keypunch Checks** – This is a required field for **Catch Weight** and **Catch Numbers of Fish**. Sum up the entries in each column and place the total in the corresponding keypunch box at the bottom of the form.



## IX. Collecting and Documenting Species Composition

Once the catch has been placed into catch categories, a species composition sample can be taken from all, some, or only one of the catch categories. (See Figure 4-17) Species composition samples can consist of every individual in the catch category or a subsample of the individuals in the catch category. Subsamples must be representative of the entire catch category.

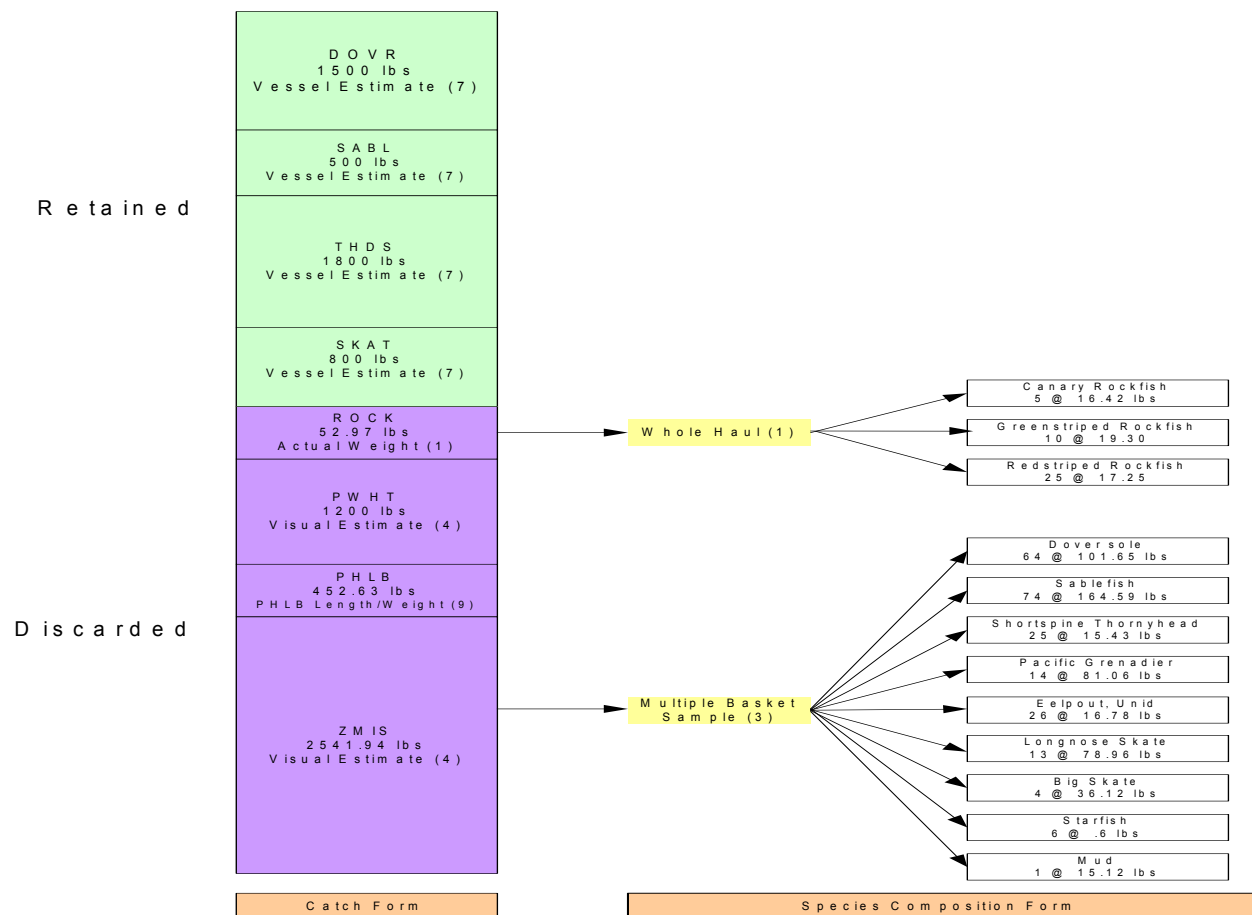


Figure 4-17: Catch to Species Composition

## Methods for Species Composition Sampling:

If Weight Method 1 – Actual Weights and Sample Method 1 – Whole Haul are used and the whole haul weight is different than actual weight, record the whole haul weight on the Catch Form.

### *Sample Method 1 - Whole Haul*

1. Sort all individuals in catch category to species.
2. Weigh and count all individuals by species.

### *Sample Method 2 - Single Basket*

1. Randomly take one representative basket from the catch category.
2. Sort individuals in basket to species.
3. Weigh and count all individuals by species.

### *Sample Method 3 - Multiple Basket*

1. Randomly take two or more representative baskets from catch category.



**Tip\*** Multiple basket samples should weigh, at minimum, 500lbs.

2. Sort individuals in baskets to species.
3. Weigh and count individuals by species.

## Average Number Calculations

**Single species catch categories** - Document only those individuals that have been actually weighed AND counted on the Species Composition Form.

On trawl vessels, all species on the Species Composition Form **MUST** have an actual weight. However, observers do not have to count every individual in the species composition sample. **Average number calculations are used when a species composition sample contains more than one species and all individuals can not be counted.** Consider using average number calculation to estimate the number of individuals when:

- The catch category contains many small individuals of a given species/species group, such as juvenile rockfish.

- The catch category contains many individuals of the same species and counting all of them would greatly reduce the size of the species composition sample, for example flatfish species.

To determine average number:

1. Randomly collect a subsample of individuals to be counted.



**Tip\*** When doing average number calculations, count and weigh as many individuals as possible. At minimum, 15 individuals should be weighed and counted. For species that are caught in large quantities, count and weigh at least 50 individuals.

2. Weigh and count individuals in subsample.
3. Weigh entire sample of that species.
4. To determine sample number, divide the number of individuals actually counted by the weight of the individuals counted and then multiply by the total sample weight.



$$\text{Total Sample \#} = \frac{\text{\# of Individuals Actually Counted} \times \text{Total Sample Wt (lbs)}}{\text{Wt of Individuals Counted(lbs)}}$$

### **Species Composition Form Instructions**

The species composition information collected is recorded on the Species Composition Form (See Figure 4-18).

- **Haul Number** – Record the number of the haul that the sample came from.
- **Date** – Record the date as MM/DD/YY.
- **Trip Number** – Record the trip number generated by the database system.



- **USCG #** - Record the USCG vessel number (if they have one). If the vessel does not have a USCG number, leave this field blank.
- **Catch #** - Record the number that corresponds to the catch category on the Catch Form.
- **Sample Method** – Record the method used to sample the catch category.
  - 1 – Whole Haul
  - 2 – Single Basket
  - 3 – Multiple Baskets
- **# Of Baskets** – This field is not required at this time. (Species Composition form v.4 does not have this column)
- **Catch Category** – Record, in capital letters, the catch category sampled using the 3 or 4-Letter PacFin code. For a list of PacFin catch category codes, see Appendix F: Catch Categories and Target Strategies on page 22.
- **KP Weight and KP Number** – Sum the total weight of all species in the catch category sample and place the total weight in the Key punch (KP) Weight box. Sum up the total number of all species in the catch category sample and place the total number in the Key punch (KP) Number box.
- **R or D** – Record whether the catch category sampled was **R** – Retained or **D** – Discarded.
- **Species** – Record the common name of the species in the sample. This column must be filled in with the species name. Do not only enter the species code! The common name listed on the paperwork must match the common name used in the database (see Appendix A: Fish Species List and Codes on page 2, Appendix B: Invertebrate Species List and Codes on page 14, Appendix C: Marine Mammal and Sea Turtle Species List

and Codes on page 17, Appendix D:Seabird Species List and Codes on page 19 for lists of species.)

- **Species Code** – Record the species code of the corresponding species. This can be done prior to entering data and not on deck. (see Appendix A:Fish Species List and Codes on page 2, Appendix B:Invertebrate Species List and Codes on page 14, Appendix C:Marine Mammal and Sea Turtle Species List and Codes on page 17, Appendix D:Seabird Species List and Codes on page 19 for lists of species.).
- **Sample Weight** – Record the total weight of the species in the sample. **This weight MUST be an actual weight.**
- **Fish Number** – Record the number of fish of each species in the sample. This number may be an actual count (preferred) or extrapolated.



**Tip\*** Numbers of fish are only extrapolated in multiple species catch categories. For single species catch categories, record only those actually weighed AND counted on the Species Composition Form.

- **Discard Reason** – Record the skipper/crew's reason for discard for unsampled (no species composition sample taken) discarded catch categories only.
  - 11 - Incidental/Accidental
  - 12 - Drop-off
  - 13 - Market
  - 14 - Other
  - 15 - Predation
  - 16 - Regulation
  - 17 - Safety
- **Basket Weight and Number** – Use this column on deck to document numbers and weights of species. Be

Page \_\_\_\_ of \_\_\_\_

USCG # 

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[illegible]

Figure 4-18: Species Composition Form

## **X. Mixed Hauls**

Occasionally, a vessel will dump a haul on top of another. There are a two options for documentation and sampling when this occurs.

- If you have taken a species composition sample from the first haul prior to the second haul being dumped on top:
  - Record the two hauls as two separate hauls.
  - Use a visual estimate for the OTC of the second haul.
  - Visually estimate or use other weight methods to estimate the weight of discard from first haul.
  - Record species composition from first haul.
  - If possible, visually estimate the weight of discard on second haul. If not possible, use OTC - Retained weight on Catch Form.
  - Do not take a species composition sample from second haul.
- If you have not taken a species composition sample from the first haul prior to the dump:
  - Record the hauls as one haul, using the start time/location/etc. from the first haul and the end time/location/etc. from the second. Be sure to document in notes that they were recorded as two separate hauls in vessel logbook.
  - Sum total catch estimates of first and second haul and record as OTC. If two weight methods were used to determine total catch, document as weight method 6 - Other and document how weight was estimated in Haul Comments.
  - If vessel records as two separate hauls, copy retained catch categories and weights (sums of weights if same catch category) from both hauls onto one Catch Form.

- Estimate the total weight of discard from both hauls. Record weight on Catch Form.
- Take a random, non-biased, representative species composition sample from the combined hauls.

OR

- Record the hauls as two separate hauls.
- Copy vessel's estimate of retained catch categories for each haul on separate Catch Forms.
- Estimate discard weight for each haul. Try to visually estimate, at minimum. If unable to independently estimate, use OTC - Retained for discarded catch category estimates.
- Do not take species composition samples for either haul.

## **XI. Working Smarter, Not Harder**

When sampling on deck, think about ways to minimize the amount of effort, especially lifting, that needs to be accomplished. Here are some things to consider:

- **Don't weigh fish more than once.** For instance, if you are going to whole haul a catch category, do not weigh the full baskets and then sort and weigh the individual species. Instead, sort into species and weigh, then use the sum of all the weights as the catch category weight.
- **Take care of small individuals (i.e. thornyheads) separately from larger individuals.** Small thornyheads are often discarded in the deep water fishery. These individuals are hard to handle and time consuming to identify. One option for dealing with them and getting a subsample so the percentage of shortspine to longspine can be determined, is to split the small species into a separate catch category from the larger species. Determine the catch category weight of the small species and take a one or two basket sample. The larger species

can then be sampled more accurately. This also applies to discard of small flatfish.

- **When there is a large amount of discard of a single species, estimate the weight of that species separately from other discarded species.** For instance, some hauls have a large amount of arrowtooth flounder or spiny dogfish shark discard. Observers can visually estimate the weight of these species, take a single basket species composition sample, and then use a more accurate method for the weight of other discarded species.
- **Consider all options when a haul has a large number of Pacific halibut.** Crew members will usually presort as much of the Pacific halibut as possible. This usually occurs very quickly and can be very overwhelming for observers. When large numbers of Pacific halibut are in the haul, consider using one of the following:
  - Visually estimate the length of all PHLB and use weight method 9 - Length/Weight Conversion.
  - Split Pacific halibut into two catch categories. Visually estimate the length of all the halibut thrown over by a given crew member or during a randomly selected time. Tally (count) all those Pacific halibut that you are not estimating the length of. You will have two catch categories on the Catch Form. One catch category will include those PHLB that you visually lengthed and will be a weight method 9 - PHLB Length/Weight. The second catch category will include those halibut that were tally sampled. To determine the weight of these halibut, multiply the average weight from the visually lengthed PHLB by the number tallied. Document the catch category with a weight method of 8 - extrapolation. The “# of Fish”

column on the Catch form should be completed for both PHLB catch categories.

- Split Pacific halibut into two catch categories. Visually estimate the length of all the halibut in a randomly selected section of deck or time period. These will be in a PHLB catch category with weight method 9 - PHLB Length/Weight. For the rest of the PHLB not visually estimated, create another catch category of PHLB, with a weight method of 4 - visual estimate. Determine the average weight of the PHLB sampled by weight method 9 and multiply it by the proportion of deck/time not sampled ( $1/2$ ,  $1/4$ ). The “#’s of Fish” column will be blank for this catch category.
- **Bottom line: Get creative.** Remember that there are 7 weight methods (not including OTC - Retained and Other) that can be used to determine catch category weights on trawlers. Using a combination of methods on a single haul often results in better estimates of discard and less work for you. Talk with year-round observers for ideas for specific fisheries and/or vessels.

## **XII. Unsampled Hauls**

There may be times when a haul cannot be sampled due to illness, injury, or weather conditions. When a haul is not sampled:

### **Trip Form**

- Record location, gear, and other information just like it is recorded for a sampled haul.
- Observer Total Catch Estimate – At minimum, make a visual estimate of the total catch weight.

### **Trawl/Prawn Catch Form**

- Record vessel estimates of retained catch categories.
- For discarded catch categories, place all species in one category. Subtract the vessel estimates of retained species from the visual estimate of OTC. Use Weight Method 5 – OTC – Retained to obtain an estimate of the discarded catch weight.
- Document the appropriate reason for discard for the catch category.

### **XIII. Discard That Cannot Be Attributed To A Specific Haul**

On rare occasions, a vessel will discard fish from the hold. This happens if market conditions change during a trip or if they are catching larger fish that are worth more money. Record discard that cannot be attributed to a specific haul on the Trip Discard Form (See Figure 4-19).

The Trip Discard Form is not entered into the database system. Document the information from the Trip Discard Form in the Trip Comments on the Trip Page.

### **Trip Discard Form Instructions**

- **Trip Number** – Record the trip number generated by the database system.
- **USCG #**– Record the USCG vessel number. If the vessel does not have a USCG number, leave this field blank.
- **Date** – Document the month (MM) and day (DD) that the trip discard took place.
- **Time** – Document the time, in PST military time, that the trip discard took place.



- **Species** – Document the common name of the species that was discarded.
- **Weight** – Document the weight, in pounds, of species discarded.
- **# Of Fish** – Document the number of fish discarded (if known).
- **Weight Method** - Document the weight method used to estimate the species weight.
  - 1 - Actual Weight
  - 2 - Bin/Trawl Alley Estimate
  - 3 - Basket Volume Determination
  - 4 - Visual Estimate
  - 5 - OTC-Retained
  - 6 – Other
  - 7 - Vessel Estimate
  - 8 – Extrapolation
  - 9 - PHLB Length/Weight Conversion
- **Discard Reason** - Record the skipper/crew's reason for discard for unsampled (no species composition sample taken) discarded catch categories only.
  - 11 - Incidental/Accidental
  - 12 - Drop-off
  - 13 - Market
  - 14 - Other
  - 15 - Predation
  - 16 - Regulation
  - 17 - Safety
- **Comments** – Document any additional information that is important.

## CHAPTER 4

### Trawl Sampling

[illegible]

Figure 4-19: Trip Discard Form

## XIV. Examples

Macy Fields observed the F/V Allegiance (USCG # 769243), a 63-foot, limited entry trawler captained by Greg Sampson. Macy recorded sampling, safety, and other important information in her logbook, number 54. The vessel used a selective flatfish net (pineapple net) on all three hauls. Upon return, the catch was documented on fish ticket X943691, issued on 04/21/2005. The vessel completed the following logbook page:

Vessel Name <u>ALLEGIANCE</u>		Departure: Date <u>04/19/05</u>		Time <u>1900</u>		Port <u>Westport</u>	
Federal Document No. <u>769243</u>		Return: Date <u>04/21/05</u>		Time <u>0500</u>		Port <u>Westport</u>	
Crew Size (including Captain) <u>3</u>		Buyer(s)					

DATE mo/day	TIME local 24-hour clock	LATITUDE		LONGITUDE		Average depth of catch (fathoms)	NET TYPE	Target Strategy	Estimated pounds retained each tow - enter 4-letter code from species code list provided											
		Degrees	Minutes	Degrees	Minutes				EGGS	PTIL	REX	OFLT	SLAT	YTRK	PCOD	DOMR	NSLF			
04/19	set	1820	39	52.41	128	01.32	80	B	NSM	25	300	10	90	120	120					
	up	2040		44.23	128	59.01														
04/20	set	0725		44.04	128	03.62	71	B	NSM	1500	700	150		650		2000	30	25		
	up	1035		44.17		03.64														
04/20	set	1418		44.36		03.84	71	B	NSM	1000	950	300		300		2000	70			
	up	1735	39	44.35	128	03.83														
	set																			
	up																			
	set																			
	up																			
	set																			
	up																			
	set																			
	up																			
	set																			
	up																			

REMARKS:

Signed: \_\_\_\_\_

TO BE COMPLETED BY AGENCY	
VESSEL	FISH RECEIVING TICKET NO.
PORT	

64347

Prior to leaving the dock, Macy measured the trawl alley. The length of the alley was 4.3m and it's width was 1.3m. The vessel steamed out to the grounds and set it's first haul. Macy checked the vessel logbook to be sure the captain was recording the fishing effort information and then waited for haul back. The vessel hauled back its first haul which Macy visually estimated the total catch to be 7000lbs. The codend had a lot of spiny dogfish in it, which Macy knew clumps on deck and would make a bin volume impossible. So, she took codend measurements as soon as the bag was on deck, which were length=3.2m, width=2.1m, and height=.5m, .47m, and .48m. Prior to the sort, she randomly took two density baskets, filled to the top of the holes. They weighed 80.1lbs and 77.6lbs. First, the vessel presorted sablefish. She randomly collected sablefish for average weight and tallied 15 additional fish. She counted and weighed the sablefish she collected, which was 17@36.5lbs. Next, the vessel worked quickly to get the spiny dogfish off the vessel. Macy did a quick visual estimate, based on experience. She estimated that 4000lbs of spiny dogfish was discarded. The remainder of haul was mostly retained so Macy decided to actually weigh the remaining discard. After speciating the discard, she weighed and counted it all. She found:

<b>Lingcod</b> 12 @ 67.6lbs, 13 @ 57.3lbs	<b>Dungeness Crab</b> 7 @ 8.0lbs
<b>Starfish</b> 6 @ 7.2lbs	<b>Arrowtooth Flounder</b> 12 @ 15.3lbs
<b>Pacific Sanddab</b> 150 @ 66.5, ? @ 46.8lbs	<b>Ratfish</b> 1 @ 1.1lbs
<b>Big Skate</b> 10@ 62.17lbs, 7 @ 43.53lbs	<b>Longnose Skate</b> , 16 @ 68.3lbs, 12 @ 51.8lbs, 15 @ 53.0lbs, 10 @ 29.8lbs
<b>Sandpaper Skate</b> 1 @ 1.5lbs	<b>Jellyfish</b> 2 @ 1.3lbs
<b>Pacific hake</b> 1 @ .8lbs	<b>Flathead sole</b> 5 @ 4.5lbs
<b>Petrals sole</b> 1 @ 1.0lbs	<b>Rex sole</b> 3 @ .9lbs

Macy asked Greg why he was discarding each species. He told her that the lingcod, dungeness crab, pacific hake, and sablefish were discarded due to regulation. The sanddabs, ratfish, skates, and rex sole were discarded due to market and the arrowtooth, flathead, and petrale sole should not have been discarded but the crew missed them in the sort

The vessel brought the second haul aboard. Macy visually estimated it at 12000lbs, with lots of different species. The vessel dumped the bag on deck and Macy took three height measurements, .79m, .70m, and .66m. She quickly grabbed two randomly selected density baskets, filled to the top of the holes, which weighed 81.8lbs and 74.5lbs. Macy noticed lots of Pacific halibut which she knew would be presorted. She visually estimated each presorted halibut and found 7 @ 50cm, 27 @ 60cm, 4 @ 70cm, 16 @ 80cm, 12 @ 90cm, 1 @ 100cm, and 1 @ 110cm. She asked the deckhands to give her all the rockfish and Dungeness crab. She realized there would be a large volume of discard which was going to be sorted out the scupper. She decided to employ a visual

temporal sampling scheme. She estimated it would take 2 hours to sort the catch. She decided to collect two baskets of discard at a time systematically throughout the haul. The crew started the sort at 10:42. She took samples at 10:55-10:58, 11:15-11:20, 12:01-12:06, 12:17-12:20, and 12:29-12:32. The crew ended the sort at 12:36. When she sorted her baskets she found:

<b>Petrable sole</b> 52 @ 42.2lbs	<b>Rex sole</b> 57 @ 28.9lbs
<b>Sablefish</b> 15 @ 32.6lbs, 19@ 38.0lbs	<b>Arrowtooth flounder</b> 17 @ 44.2lbs
<b>Urchins</b> 52 @ 10.5lbs, ? @ 4.7lbs	<b>English sole</b> 25 @ 13.5lbs
<b>American shad</b> 9 @ 18.4lbs	<b>Pacific sanddab</b> 96 @ 19.3lbs
<b>Spiny dogfish</b> 6 @ 65.1lbs, 8 @ 74.6lbs, 6 @ 59.7lbs, 7 @ 71.2lbs, 5 @ 46.5lbs	<b>Longnose skate</b> 4 @ 33.6lbs
<b>Dover sole</b> 3 @ 1.4lbs	

Once the crew was done sorting, she collected all the rockfish and prohibited species set aside by the crew. Macy weighed and counted all of the discarded rockfish and prohibited species. She found:

<b>Yellowtail rockfish</b> 17 @ 52.4lbs	<b>Greenstripe rockfish</b> 49 @ 16.3lbs
<b>Darkblotched rockfish</b> 189 @ 88.3lbs	<b>Canary rockfish</b> 4 @ 18.1lbs
<b>Dungeness crab</b> 4 @ 4.7lbs	<b>Redstripe rockfish</b> 1 @ .75lbs

Macy asked again about the reasons for discard. Greg told her the rockfish were all discarded due to regulation.

Everything else was the same as last haul, except the rex, dover, and english were discarded accidentally and the arrowtooth because the market wouldn't take that size, and the shad because he couldn't sell it.

The vessel brought up it's final haul of the trip. It was bigger than the last one, so Macy visually estimated it at 15000lbs. She knew it was going to be a difficult haul to sample because it had Pacific halibut, lingcod, and sablefish that would be presorted, as well as a bunch of other discard. She quickly took three height measurements for the total catch estimate, .86m, .86m, and .88m. She took two density baskets, filled to the holes, which weighed 75.2lbs, and 80.4lbs. The crew quickly began it's presorted. She asked them to let her know when they were throwing something over. She visually estimated each Pacific halibut length, randomly collected lingcod and sablefish for average weights and tallied the rest. For Pacific halibut, she found 3 @ 50cm, 8 @ 60cm, 2 @ 70cm, 3 @ 90cm, 7 @ 100cm, 7 @ 110cm, and 1 @ 140cm. She tallied sampled 10 lingcod, in addition to the 17 @ 138.8lbs she weighed for average weights. She weighed 15 sablefish at 36.1lbs and tallied an additional 81 fish. She noticed some canary and darkblotched rockfish (priority species) so asked the crew to give her all of them. For the remaining discard, she decided to employ a random spatial frame, as the crew was leaving the discard in the trawl alley. She took all of the discard from a randomly selected 1/4 of the trawl alley. She collected 17 baskets and used 9 of them for species composition. The baskets not used for species composition weighed 71.63lbs, 65.94lbs, 69.16lbs, 75.7lbs, 61.43lbs, 59.96lbs, 70.69lbs, 66.66lbs, and a partial basket weighing 15.54lbs. She sorted the species composition baskets and came up with

:

<b>Sandpaper skates</b> 3 @ 5.4lbs	<b>Longnose skates</b> 6 @ 52.3lbs
<b>Sablefish</b> 12 @ 31.8lbs	<b>Urchin</b> 200@ 28.3lbs, 200@ 27.2lbs
<b>Spiny dogfish</b> 9 @ 91.2lbs, 6 @ 75.6lbs, 7 @ 81.2lbs, 6 @ 64.8lbs, 6 @ 58.3lbs	<b>Arrowtooth flounder</b> 20 @ 50.2lbs, 16@ 42.6lbs
<b>American shad</b> 5 @ 8.4lbs	<b>Rex sole</b> 32 @ 9.5lbs
<b>English sole</b> 9 @ 8.2lbs	<b>Starfish</b> 4 @ 3.5lbs
<b>Petrale sole</b> 15 @ 14.8lbs	<b>Ratfish</b> 1 @ .1lbs
<b>Pacific sanddab</b> 65 @ 13.9lbs	

She quickly weighed all the canary and darkblotched rockfish in the discard. There were 2 canary at 8.9lbs and 25 darkblotched at 16.6lbs.

Macy asked the skipper one final time about reason for discard. He said the skates should all of been kept but the crew must have been tired, the sablefish, lingcod, canary, and darkblotched was regulatory discard., and everything else was the same as previous hauls.



**CHAPTER 4**  
**Trawl Sampling**

Haul # 0 1

**TRAWL/PRAWN CATCH FORM\***

Page 1 of 2

Date 0 4 1 9 0 5 Trip Number 4 7 6 1 USCG # 7 6 9 2 4 3

Catch #	R or D	Catch Category	Catch Weight	Volume	Density	#'s of Fish 1. Req. for wt. methods 8,9 2. Req. if actual # for wt. methods 4,6	Weight Method	Catch Purity	Discard Reason	Vessel Estimate	Comments
1	R	EGLS	25				7	P			
2	R	PTRL	300				7	P			
3	R	REX	10				7	P			
4	R	OFLT	90				7	M			
5	R	SKAT	120				7	P			
6	R	YTRK	120				7	P			
7	D	DSRK	4000				4	P	3		
8	D	ZMIS	588.4				1	M			
9	D	SABL	68.71			32	8	P			
Key punch Check			5322.11			32					

\*Gear Types 1, 2, 3, 4, 5, 14, 17

January 2006

Trawl/Prawn Catch Form v. 5

**CHAPTER 4**  
**Trawl Sampling**

Official Total Catch Calculations

Method: 10- Codend

Visual 7000 lbs

Measurements:

l-3.2

w-2.1

h-.50  $h_{avg} = \sqrt{.48333}$

.47

.48

Density Samples:

.032

80.1

77.6

$\frac{157.7}{2} = 78.85$

$D = \frac{78.85 \text{ lbs}}{.032 \text{ m}^3} = 2464.0625 \text{ lbs/m}^3$

Formula:  $v = .7854 (l)(w)(h)$

Additional  
Calculations:  $v = .7854 (3.2\text{m})(2.1\text{m})(.48333333\text{m}) = 2.550979191 \text{ m}^3$

$OTC = (v) \times (D) = (2.550979191 \text{ m}^3) \times (2464.0625 \text{ lbs/m}^3)$

$OTC = 6285.772162 \text{ lbs}$

**CHAPTER 4**  
**Trawl Sampling**

Haul # 0 1

**SPECIES COMPOSITION FORM**

Page 2 of 2

Date 0 4 1 9 0 5 Trip Number 4 7 6 1 USCG # 7 6 9 2 4 3

Catch #	Catch Category	Sample Method	KP Weight KP Number	R or D	Species	Species Code	Sample Weight	Fish #	Discard Reason	Basket Weight	#	Basket Weight	#
8	ZMIS	1	588.4 390	D	Lingcod	603	124.9	25	16				
					Dungie Crab	12	8.0	7	16				
					Starfish	20	7.2	6	13				
					Arrowtooth	141	15.3	12	11				
					P. Sanddab	137	113.3	256	13	66.5 46.8	150		
					Ratfish	99	1.1	1	13				
					Big skate	550	105.7	17	13				
					Longnose skate	554	202.9	53	13				
					Sandpaper skate	555	1.5	1	13				
					Jellyfish	35	1.3	2	13				
					Hake	206	.8	1	16				
					Flathead	103	4.5	5	11				
					Petrals	112	1.0	1	11				
					Rex Sole	105	.9	3	13				
9	SABL	2		D	SABL	203	36.5	17	16				

Trawl Sample Methods : 1-Whole haul species 2-Single basket 3-Multiple basket Fixed Gear Sample Methods 4-FG Sample 5-FG(Verified Fish Ticket) 6-FG(Unverified Fish Ticket) Species Composition Form v.4  
Reasons for Discard: 11-Incidental/Accidental 12-Drop-off 13-Market 14-Other 15-Predation 16-Regulation 17-Safety January 2006

**CHAPTER 4**  
**Trawl Sampling**

R or D	Catch Category	Density Samples	Measurements, Formulas, and Calculations	Total Weight
D	ZMIS	PSDAB 150 @ 66.5  Total wt=113.3	$\frac{150 \text{ fish}}{66.5 \text{ lbs}} \times 113.3 \text{ lbs} = 255.5639096 \text{ fish}$	= 256 fish
D	SABL	17@36.5  IWI IWX IWI + tallied  Total = 32	SABL = $\frac{36.5 \text{ lbs}}{17 \text{ fish}} \times 32 \text{ fish} = 68.71 \text{ lbs}$	SABL= 68.71 lbs
		DSRK – visual 4000lbs discarded		

**CHAPTER 4**  
**Trawl Sampling**

Haul #		TRAWL/PRAWN CATCH FORM*										Page 1 of 2									
Date		Trip Number					USCG #														
0 4 2 0 0 5		4 7 6 1					7 6 9 2 4 3														
Catch #	R or D	Catch Category	Catch Weight	Volume	Density	#'s of Fish 1. Req. for wt. methods 8,9 2. Req. if actual # for wt. methods 4,6	Weight Method	Catch Purity	Discard Reason	Vessel Estimate	Comments										
1	R	EGLS	1500				7	P													
2		PTRL	700				7	P													
3		REX	150				7	P													
4		SKAT	650				7	P													
5		PCOD	2000				7	P													
6	↓	DOVR	30				7	P													
7	R	NSLF	25				7	M													
8	D	PHLB	718.67			68	9	P	16												
9	D	ROCK	180.55				1	M													
10	D	ZMIS	3626.40				4	M													
Keypunch Check			9580.62			68															

\*Gear Types 1, 2, 3, 4, 5, 14, 17

January 2006  
Trawl/Prawn Catch Form v. 5

## CHAPTER 4

### Trawl Sampling

#### Official Total Catch Calculations

Method: 2- Bin

Visual 12000 lbs

Measurements:

l-4.3 m

w-1.3 m

h-.79  $h_{avg} = .7166666666$  m

.70

.66

Density Samples: .032 m<sup>3</sup>

81.8 lbs

74.5 lbs

156.3 lbs  
2 = 78.15 lbs

$$D = \frac{w}{v} = \frac{78.15 \text{ lbs}}{.032 \text{ m}^3} = 2442.1875 \text{ lbs/m}^3$$

Formula:

$$v = (l)(w)(h)$$

$$v = (4.3\text{m})(1.3\text{m})(.71666666\text{m}) = 4.006166662\text{m}^3$$

Additional  
Calculations:

$$\text{OTC} = (v) \times (D) = (4.006166662 \text{ m}^3) \times (2442.1875 \text{ lbs/m}^3)$$

$$\text{OTC} = 9783.810144 \text{ lbs}$$

**CHAPTER 4**  
**Trawl Sampling**

Haul # 0 2

**SPECIES COMPOSITION FORM**

Page 2 of 2

Date 0 4 2 2 0 5 Trip Number 4 7 6 1 USCG # 7 6 9 2 4 3

Catch #	Catch Category	Sample Method	KP Weight KP Number	R or D	Species	Species Code	Sample Weight	Fish #	Discard Reason	Basket Weight	#	Basket Weight	#
9	Rock	1	180.55 264	D	Yellowtail RF	321	52.4	17	16				
					Greenstripe RF	313	16.3	49	16				
					Darkblotch RF	311	88.3	189	16				
					Canary RF	314	18.1	4	16				
					Dungeness	12	4.7	4	16				
					Redstripe RF	324	.75	1	16				
10	ZMIS	3	604.4 404	D	Petrale	112	42.2	52	11				
					Rex	105	28.9	57	11				
					SABL	203	70.6	34	16				
					ARTH	141	44.2	17	13				
					Urchins	54	15.2	75	13	10.5	52		
					EGLS	108	13.5	25	11				
					A. Shad	606	18.4	9	13				
					P. Sanddab	137	19.3	96	13				
					DSRK	66	317.1	32	13				
					Longnose skate	554	33.6	4	13				
					Dover	107	1.4	3	11				

Trawl Sample Methods : 1-Whole haul species 2-Single basket 3-Multiple basket Fixed Gear Sample Methods 4-FG Sample 5-FG(Verified Fish Ticket) 6-FG(Unverified Fish Ticket) Species Composition Form v.4  
Reasons for Discard: 11-Incidental/Accidental 12-Drop-off 13-Market 14-Other 15-Predation 16-Regulation 17- Safety January 2006

**CHAPTER 4**  
**Trawl Sampling**

Species Composition Measurements and Calculations

R or D	Catch Category	Density Samples	Measurements, Formulas, and Calculations	Total Weight
D	PHLB		50       60       70       80       90       100   110   7@2.95=20.65 27@5.31=143.37 4@8.77=35.08 16@13.51=216.16 12@19.80=237.60 1@27.87=27.87 1@37.94=37.94 68 718.67	
D	ZMIS		Urchins 52 fish X 15.2 lbs = 75.27619047 10.5 lbs	75 fish
D	ZMIS	Visual Start sort: 1042 End sort: 1236	2 baskets Sample 1055- 1058 -3min 1115- 1120 -5min 1201- 1206 -5min 1217- 1220 -3min 1229- 1232 -3min Sample wt = KP SC Form = $\frac{604.40 \text{ lbs}}{19 \text{ min}}$ X 114 min ZMIS = 3626.3999999 lbs	3626.40



**CHAPTER 4**  
**Trawl Sampling**

Haul #		TRAWL/PRAWN CATCH FORM*										Page 1 of 2					
Date		Trip Number					USCG #										
0 4 2 0 0 5		4 7 6 1					7 6 9 2 4 3										
Catch #	R or D	Catch Category	Catch Weight	Volume	Density	#s of Fish 1. Req. for wt. methods 8,9 2. Req. if actual # for wt. methods 4,6	Weight Method	Catch Purity	Discard Reason	Vessel Estimate	Comments						
1	R	EGLS	1000				7	P									
2	R	PTRL	950				7	P									
3	R	REX	300				7	P									
4	R	SKAT	300				7	P									
5	R	PCOD	2000				7	P									
6	R	DOVR	70				7	P									
7	D	PHLB	671.81			31	9	P	16								
8	D	LCOD	220.45			27	8	P									
9	D	SABL	231.04			96	8	P									
10	D	ZMIS	4896.04				4	M									
11	D	ROCK	25.50				1	M									
Keypunch Check			10664.84			154											

\*Gear Types 1, 2, 3, 4, 5, 14, 17

January 2006  
Trawl/Prawn Catch Form v. 5

**CHAPTER 4**  
**Trawl Sampling**

Official Total Catch Calculations

Method: Bin

Measurements:

Visual – 15000 lbs

.032m<sup>3</sup>

l-4.3 m  
w-1.3m     $h_{avg} = .8666666666$   
h-.86  
.86  
.88

Density Samples:

75.2 lbs  
80.4 lbs  
155.6 lbs = 77.8 lbs  
2

$D = \frac{w}{v} = \frac{77.8 \text{ lbs}}{.032 \text{ m}^3} = 2431.25 \text{ lbs/m}^3$

Formula:  $V = (l) \times (w) \times (h)$   
 $V = (4.3\text{m})(1.3\text{m})(.866666666\text{m}) = 4.844666661\text{m}^3$

Additional  
Calculations:

$OTC = V \times D = 4.844666661\text{m}^3 \times 2431.25 \text{ lbs/m}^3$

$OTC = 11778.59581 \text{ lbs}$

**CHAPTER 4**  
**Trawl Sampling**

Haul #		0 3		<b>SPECIES COMPOSITION FORM</b>										Page 2 of 2	
Date		0 4 2 0 0 5		Trip Number		4 7 6 1		USCG #		7 6 9 2 4 3					

Catch #	Catch Category	Sample Method	KP Weight		R or D	Species	Species Code	Sample Weight	Fish #	Discard Reason	Basket Weight	#	Basket Weight	#
			KP Number											
8	LCOD	3			D	LCOD	603	138.8	17	16				
9	SABL	3			D	SABL	203	36.1	15	16				
10	ZMIS	3	667.3		D	Sandpaper	555	5.4	3	11				
			622			Longnose	554	52.3	6	11				
						SABL	203	31.8	12	16				
						Urchin	54	55.5	400	13				
						DSRK	66	371.1	34	13				
						ARTH	141	92.8	36	13				
						Shad	606	8.4	5	13				
						Rex	105	9.5	32	11				
						EGLS	108	8.2	9	11				
						Sea star	20	3.5	4	13				
						PTRL	112	14.8	15	11				
						Ratfish	99	.1	1	13				
						P. SDB	137	13.9	65	13				
11	ROCK	1	25.5		D	CNRY	314	8.9	2	16				
			27			DBRK	311	16.6	25	16				

Trawl Sample Methods : 1-Whole haul species 2-Single basket 3-Multiple basket Fixed Gear Sample Methods 4-FG Sample 5-FG(Verified Fish Ticket) 6-FG(Unverified Fish Ticket) Species Composition Form v.4  
Reasons for Discard: 11-Incidental/Accidental 12-Drop-off 13-Market 14-Other 15-Predation 16-Regulation 17- Safety January 2006

**CHAPTER 4**  
**Trawl Sampling**

Species Composition Measurements and Calculations

R or D	Catch Category	Density Samples	Measurements, Formulas, and Calculations	Total Weight
D	PHLB	50     60         70     80 90     100         110         140	3@2.95=8.85 8@5.31=42.48 2@8.77=17.54 3@19.80=59.40 7@27.87=195.09 7@37.94=265.58 <u>1@82.87=82.87</u> 31          671.81	
D	LCOD	17@138.8 +	LCOD <u>138.8 lbs</u> X 27 fish = 220.4470588 lbs 17 fish	220.45
D	SABL	15 @ 36.1 +   	SABL = <u>36.1 lbs</u> x 96 fish = 231.0399999 lbs 15 fish	231.04
D	ZMIS	Visual spatial ¼ of alley	Basket wt + SC sample 71.63 65.94 69.16 75.70 61.43 59.96 70.69 66.66 <u>15.54</u> + 556.71 <u>667.30</u> 1224.01 lbs	



